

Climate Variability and Change Workshop

March 4, 2005

Chico Hot Springs, Montana

Purpose: To provide an overview of our current understanding of natural climatic variability and climate change in the western U.S. and to explore the impacts of climate on park and natural areas management

Steve Gray's (USGS Tucson) presentation (pdf ~3MB)

Breakout Groups – Breakout groups were challenged to identify potential impacts of regional climate change- especially changes in timing and amounts of snowfall- for natural areas management

Key potential impacts identified by each group:

Group 1

1. Dam/reservoir system changes
2. Fish distribution and persistence affected by warm stream temperatures and lack of connectivity of streams; cold fishes especially will suffer
3. Soil moisture – timing definitely affects management of vegetation (e.g. grazing); longer, warmer and drier summer
4. Increase in forest fires
5. Distribution of animals
6. Visitor services will change with climate/season changes
7. Education – interpretation

Group 2

1. Natural disturbance regimes will increase in frequency and intensity; distributions will be wider (e.g. fire, mountain pine beetle)
2. Invasive exotics (plants, aquatic species) will increase and stress native communities
3. Low elevation species will migrate to higher elevations; constriction of higher elevation species ranges
4. Constriction of riparian zones
5. Decrease in biodiversity – subnivean mammals and fish
6. Human visitor impacts – decrease in satisfaction; increase in access

Group 3

1. Change in immigration and breeding of large mammals
2. Earlier ice off lake – change in lake stratification and trophic condition of lake
3. Warmer spring, greater fire season
4. Economic impact of longer summer – increased visitation
5. High elevation species affected – birds, plants
6. Rain on snow events – increase in flood potential

Group 4

1. Early season erosion
2. Changes in migration and hibernation
3. Lower base streamflow in summer and fall which will affect fish, water rights and riparian zones
4. More fire
5. Lower soil moisture → increased vegetation stress

Large Group Discussion - What key features of climate do we need to monitor to address these impacts?

1. Summer precipitation – distribution and amount
2. More monitoring stations are needed- especially at higher elevations.
3. Timing of snowmelt
4. Observations information, e.g. lake ice melt, plant phenology, “Green up” of vegetation
5. Discharge and streamflow

Kelly Redmond's presentation on Western Regional Climate Center website and available data (pdf ~6MB)

Questions and comments after Kelly's presentation

1. Are historic data available?
 - > Yes. Pre-1948 data are entered and are being processed.
2. Who should house climate data?
 - > WRCC role is to archive weather and climate records; no need to duplicate this effort). Parks and/or networks may want a local copy for data analysis and reporting purposes.
 - > Data from RAWS stations are automatically posted on the WRCC website.
 - > It is critical to download data directly from dataloggers into computers because satellites transmitting RAWS data have down times and can lose data.
 - > It's important to remember that most of the cost of weather stations is in salaries (approximately 80%) because stations need a lot of maintenance.
3. What is the initial cost to install a weather station and what is the cost of its maintenance?
 - > A high elevation station costs about \$5000. A station that is built to deal with snow and ice buildup will cost \$10000-\$150000.
 - > The cost for a RAWS station to be maintained by the Boise office is approximately \$1500-\$2000/year.
 - > It is better to have a few really good measurements from a few stations than a lot of measurements from poorly maintained or located stations.
4. What would we gain by adding more weather stations to the current network?
 - > It's a good strategy to have a few key sites and then clusters of satellite stations to measure local micro-variability.
 - > Universities can partner with parks to get money (from NSF, for example) for the purchase of equipment.

5. Is there soil moisture monitoring at weather stations?
 - > No, soil moisture monitoring is not well done in the US. Measuring soil moisture is difficult. It is a very important parameter, however, and would be the most important new parameter to start monitoring.
6. Is there a page on the WRCC website explaining what the data are and orienting the user to the products available?
 - > No, users generally need to know how to navigate the site.
 - > There are two issues that WRCC needs to address on its website
 1. Describing what the different data are.
 2. Explaining how to answer particular questions with the data that are available on the website. Data reports on the WRCC website are largely driven by stakeholder requests and therefore the site contains a number of products that answer commonly asked questions.

Connie Woodhouse's presentation on Paleoenvironmental Archives (pdf ~2MB)

Questions and comments after Connie's presentation

1. Do the reconstructions of paleoclimates offer any predictive capabilities?
 - > No, there is not enough understanding of low frequency oscillations to be able to predict future climate on a short term basis.
2. Data can be used to define the range of natural variability for management goals by land management agencies.
3. Temperature in the western U.S. should be thought of as a hydrologic variable that interacts with precipitation.
4. The paleorecord tells us how ecosystems respond to different lengths and magnitudes of climate change, i.e. the resilience and sensitivity of ecosystems to climate change.
5. We need more information on ecosystem reactions to temperature and precipitation.
6. Reverberations from climate change can last a long way into the future. For example, the age class structure of trees may be products of events that occurred several hundred years in the past.
7. A big question in climate science is whether there is any predictability.

Group discussion – Ideas for further interactions between climate scientists and land managers – how can we improve?

1. We need to figure out how to incorporate climate patterns into monitoring.
2. Some participants suggested that the case has not been made for adding more climate stations.

3. We need more links between climate and ecosystem processes.
4. We need to know which data should be used to answer which ecological questions.
5. Climate/weather data offer a good opportunity for park interpretation. The public is very interested in this subject.
6. Mark Loesleben (U. Colorado, Mountain Research Station) suggested that the UCAR-NCAR COMET program (<http://www.comet.ucar.edu/>) provides a useful resource for for developing interpretative products related to of weather/climate data.
6. Scientist and managers need to know how to account for low frequency patterns when interpreting climate data and ecological observations.

NOTE: There will be a web location with information from today's course.

Attendance List		
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